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RECORD OF ORAL HEARING

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JOHN DONOHUE and HONGYU YUE

Appeal No. 2010-004489
Application No. 10/500,005
Technology Center 1700

Oral Hearing Held: February 3, 2011

Before ADRIENE L. HANLON, KAREN M. HASTINGS and MICHAEL P. COLAIANNI, *Administrative Patent Judges.*

APPEARANCES:

ON BEHALF OF THE APPELLANT:

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The above-entitled matter came on for hearing on Thursday, February 3, 2011 commencing at 9:47 a.m., at the U.S. Patent and Trademark Office, 600 Dulany Street, Alexandria, Virginia, before Paula Lowery, Notary Public.

PROCEEDINGS

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THE USHER: Good morning. Calendar Number 13, Appeal No. 2010-004489, Mr. Gokhale.

JUDGE HANLON: Good morning, Mr. Gokhale.

MR. GOKHALE: Good morning.

JUDGE HANLON: You have 20 minutes. You may begin when ready.

MR. GOKHALE: I'll go ahead and get started. My name is Sameer Gokhale. I want a chance to talk about the issues in the appeal we have, and give you a chance to ask any questions you may have.

The case has two independent claims. Claim 1 is a method claim, and Claim 14 is a system claim. For each of these independent claims there are two separate rejections under 35 USC 103. Time permitting, I just want to talk about the rejection to dependent claims 23 and 24, which we also discussed in our Appeal Brief.

Just a little background of the Applicants' invention, what the Applicants have found is that in material processing, such as the manufacture of integrated circuits in etching chambers, it's important to control uniformity that goes on in this processing.

In doing so, it's also important to detect the nature of any variations that might occur in the process parameters. The Applicants have also found that when measuring whether a process fault has occurred, it's beneficial to convert the measured data of the substrate into spectral space for further analysis.

For example, if the process performance parameter that's being measured is

the etching rate at a plurality of positions on a substrate, then the measured data can be converted to spectral space. We say spectral space -- that's another way of saying that it's converted into a frequency domain.

Then after the data has been transformed into the spectral space, the transformed data can be compared with reference data to determine if a fault has occurred.

One of the benefits of having converted the data into the spectral space that the Applicants have found is any differences observed can be identified as being local or global in nature via some of the differences occurring at a low frequency spatial component or high frequency spatial component.

Turning to Claim 1, actually both Claims 1 and 14 recite the nature of measuring a process performance parameter at a plurality of positions on a sample, and transforming the measurement data into at least one spatial component in spectral space to identify a measured signature of said process when said measure's signature comprises at least one spatial component in spectral space.

Turning to the references, we note there were two separate rejections of the independent claims under 35 USC 103. In the first of these rejections, the primary reference was Flamm and the secondary reference was Gerrish. In the second of these rejections, the primary reference was Farber and the secondary reference was Gerrish.

One thing I want to do is try to converge the discussion of these two rejections a little bit because they're both going to turn on the same issue, I think, because of the way the Examiner is using that secondary reference to Gerrish.

Flamm describes a process in which etching profile and etching rates are analyzed to optimize etching parameters in a plasma chamber. Flamm describes an etching rate can be measured across the substrate.

In the office action, the Examiner interpreted the etch rate profile described in Flamm as corresponding to the claimed signature of Claim 1. But the Examiner acknowledges that Flamm doesn't disclose actually converting the data into spectral space and had relied on Gerrish as teaching that feature.

Gerrish is also directed to a method performed in a plasma chamber, and specifically what it describes is a voltage and current probe. In this art, in a plasma chamber you have Rf power being supplied to the plasma chamber overall. Sometimes there's an impedance mismatch between the Rf power source and the actual plasma chamber. So often there's an impedance matching network that's provided between the Rf source and the plasma chamber.

Due to imperfections or nonlinearities in the system, there could be some lost power before the power actually reaches the chamber. So Gerrish uses a voltage current probe to actually measure the voltage and current at the plasma chamber.

In that process to obtain accurate values of the voltage and current for further analysis, it describes taking a complex wave form of the voltage and current and transforming that wave form into the spectral space for further analysis. Specifically, it performs a Fourier transform on the data to perform the analysis.

In making the rejection, the Examiner basically takes that Fourier transform of Gerrish and applies it to Flamm, and he's basically asserting that it would

be obvious, based on Gerrish, to take a Fourier transform of the data in Flamm in order to achieve all the features of Claim 1.

The reasoning that he used in the final rejection is really what we take issue with in this case. He doesn't really focus on what the measured data is in Gerrish. In Gerrish they're actually measuring the voltage and current that's being input into the plasma chamber. There are specific reasons why they want to perform a Fourier transform on that data. He hasn't really correlated the actual measured data in Gerrish to the data that's being measured in Flamm.

In Flamm what they're measuring is the etching rate over the width of the substrate. So it's completely different than the voltage and current wave forms that are being input in the chamber.

We just don't see any correlation between what's being measured in Gerrish and what's being measured in Flamm such that it would be obvious to take that Fourier transform that's being used in Gerrish and just apply it to the data in Flamm.

Similarly, in the second ground of rejection, the 103, Farber is the primary reference. What Farber is describing is that they're measuring the surface charge over the surface of a wafer.

When they do that, they actually take an optical measurement of the surface charge, and they compare it with a reference optical image of that surface charge to determine if there are any informalities on the surface charge. Based on that, they determine if there are any processing parameters that have to be optimized.

Similarly to the previous rejection we talked about, the Examiner acknowledges that Farber just doesn't disclose transforming that data in the spectral space; and, again, he relies on Gerrish to remedy this deficiency.

JUDGE HANLON: Isn't the Examiner just generally relying on Gerrish to show that it was known to convert collected data in this spectral data for analysis?

MR. GOKHALE: I think that's one of the things I want to talk about today. A Fourier transform isn't a subtle or cosmetic transformation of data. It's very specifically to transform your data from the time domain to the frequency domain; and it's a significant transformation of the data itself, and it changes the entire appearance of the data all together.

I think you have to have some kind of rationalization to apply Fourier transforms to data because you're really trying to put the data into the frequency domain for further analysis. You have to have some motivation underlying that to actually make such a complex transformation.

I think it's important that the data in Gerrish is related to voltage and current wave forms. Really there's no voltage or current wave form in either Farber or Flamm that's being measured. It's actually across the actual substrate.

So the position we have in the Appeal Brief is really there was no correlation between what's being measured in Gerrish and what's being measured in Farber and Flamm such that it would be obvious to take that Fourier transform and actually take the measured data in these primary references and perform a Fourier transform on it.

JUDGE COLAIANNI: But, Counsel, doesn't the Examiner make a finding, or a conclusion and finding, in his answer that there is some teaching in

Gerrish as to why you would make this Fourier transform? For better accuracy and better remote control? Better monitoring?

MR. GOKHALE: The Examiner cites to a specific portion of Gerrish that describes the acts related to the phase that's existing on these voltage and current wave forms.

I don't think it's possible to take that accuracy analysis that is described in Gerrish and separate it from what the data is that it's actually trying to analyze.

I think the Examiner is trying to have it both ways a little bit. He's trying to say, well, not relying on what Gerrish is actually measuring; but he's also trying to say that it accurately analyzes what Gerrish happens to be measuring.

So I think that specific portion cited to was related to the actual voltage and current wave forms. So there's a time at that point to what Gerrish is actually measuring.

I think, at the very least, he hasn't shown any correlation between the data being measured in the primary references and the data that's being measured in the second reference, Gerrish, such that one would think it reasonable to perform a Fourier transform on their measured data, which as discussed before is actually a significant change in the data itself. It's going to change everything in the previous domain, and it changes the overall appearance of the data itself.

Those are the main points we wanted to make with regards to the independent claims. In the Appeal Brief we also had issues with the rejection of dependent Claims 23 and 24.

Claim 23, for example, recites identifying whether a process variation is global or local based on the signature of spatial components.

In the final rejection, the Examiner used an inherency rationale to make his point to the references as teaching this feature. He said it would be inherent to have this feature in that hypothetical combination of either Flamm and Gerrish or Farber and Gerrish.

In the Examiner's answer, he points to the Applicant's specification as providing sort of the basis for why it would be inherent to perform that step.

One thing we want to point out is that's a positive step of identifying whether the process is global or local based on the signature of the spatial components. In the Applicant's examples what they're really doing is when you transform that data into the frequency domain, they have low frequency components and high frequency components. When they find there's a variation between the measured signature of those frequency components and the reference signature of the frequency components, they know that if that difference occurs in low frequency areas that corresponds to a global variation.

That's been discovered, which sort of means that if the pressure is off in the system, and pressure applies to the whole surface of the substrate, so the variation at that point would be global in nature.

Whereas if there's a local anomaly in the wafer, then such a variation would show up in the high frequency components.

I think it's important, you know, to actually identify how that data can actually mean the global or local variation has occurred requires some

understanding of what the data is. I think without understanding it can't be inherent to just identify whether or not a variation is global or local.

I think, you know, the Examiner didn't really show that was known outside the specification itself to make that identification. It's not clear at all how you can say that it's inherent to perform such a positive step like that as actually identifying these features.

That's the point I wanted to make with regards to Claims 23 and 24. So those are the main points I wanted to talk about today. If you have any questions --

JUDGE HANLON: Do you have any questions?

JUDGE COLAIANNI: No questions.

JUDGE HASTINGS: No.

MR. GOKHALE: Thank you very much.

JUDGE HANLON: Thank you.

(Whereupon, the proceedings at 10:00 a.m. were concluded.)